PCI-Based Reconfigurable Computers

The Reconfigurable Computing Developer's Program presents the "Company of the Quarter" award to Annapolis Micro Systems, Inc. (Annapolis, Maryland), developer of the first commercially available, PCI-based reconfigurable computing board.

Annapolis Micro Systems, founded in 1982, has a strong background in hardware design, ASICs, system drivers and operating systems. The 33-person company provides custom electronic product design services, including expert Xilinx design services, to commercial and government employees. It has completed more than 400 Xilinx-based designs.

Annapolis has started moving away from contract work (although they still have a large ASIC design business) to focus on their reconfigurable WILDFIRE™ systems and design tools (based on the SPLASH technology developed by the Supercomputing Research Center and licensed by the National Security Agency). Using XC4000E series FPGAs, the WILDFIRE family turns a PC into a supercomputer by unleashing the power of reconfigurable computing.

WILDFIRE systems have been used to test complex algorithms, emulate ASIC designs, model computer architectures, and perform rapid prototyping for image processing, DSP, communications, text search, compression/decompression, sequence analysis, and pattern matching applications. By downloading algorithms directly into FPGAs, processing speeds far exceed those possible with standard, Von Neumann architectures. In a recent test, a particular DSP application on one WILDFIRE board outperformed a Cray YMP supercomputer by a factor of 15.

The WILDFIRE family now includes both VME and PCI systems. The original WILDFIRE system is based on a VME board with 16 parallel processing elements (PE). Each PE is composed of an XC4010E, XC4013E, or XC4020E FPGA and 512 Kbytes of high-speed memory.
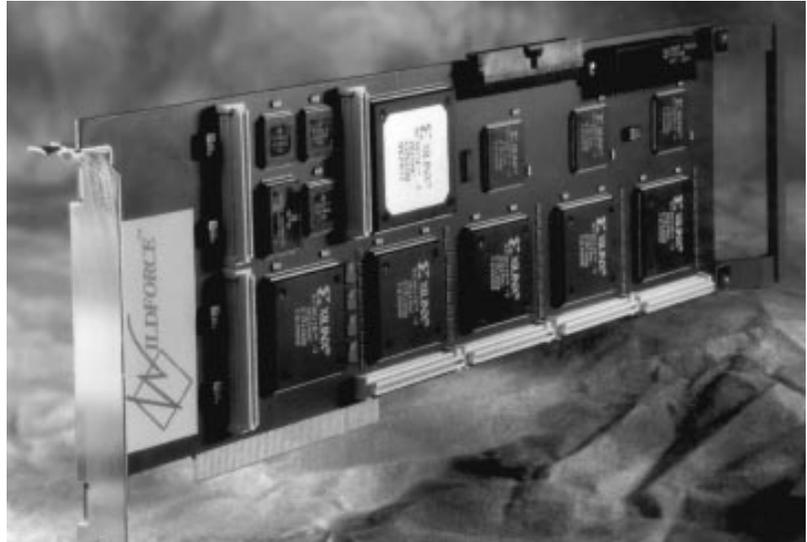
Another XC4000E device implements the crossbar connections between the PEs.

As many as 16 WILDFIRE boards can fit in a single WILDFIRE VME chassis for greater capacities. Other configurations include:

- WILDCHILD — identical to WILDFIRE, but with eight PEs.
- WILDFORCE — a standard-size PCI card with four PEs, a user-programmable crossbar and provisions for add-on capabilities.
- WILD-ONE — a half-size PCI card with one PE, with provisions for add-on capabilities.

The WILDFORCE and WILD-ONE boards can be populated with XC4013E, XC4020E, or XC4025E FPGAs.

All of these systems share a common architecture, system controller, debugger and run-time libraries. They are "programmed" using industry-standard C and VHDL tools. The reconfigurable processors can support SIMD (single-instruction-multiple-data), MIMD (multiple-instruction-multiple-data) and systolic computing operations. ◆

To learn more about WILDFIRE, please contact Annapolis Micro Systems, Inc. at 410-841-2514 or Annapmicro@aol.com.

For more information about the Xilinx Reconfigurable Computing Developer's Program, visit WebLINX at www.xilinx.com/ programs/reconfig.htm or call John Watson at 408-879-6584.